

Ch 6 HW Assignment: Answers & HW Hints (Pt. 1)

Part 1: Coefficient of Friction

**Pg. 131-133 #1-3, 7, 8, 14b, 17, 20, 21,
23, 25-27, 29**

Answers

1a. 198.45N

b. 123.48N

2. 156.8N

3a. 188.65N

b. 0.57m/s^2

7a. 10.99N

b. 0.14m/s^2

8. 0.58

14b. 2.17m/s^2

17a. No, since $F_{s,\text{max}}=7.2\text{N}$

b. $(-12\mathbf{i} + 5\mathbf{j})\text{N}$

20a. 8.57N

b. 46.16N

c. 38.64N

21a. $16.65\mathbf{i}$ N

b. $19.65\mathbf{i}$ N

c. $14.78\mathbf{i}$ N

23. 102.62N

25. 0.372

26. 18.4°

27a. 3.49m/s^2

b. 0.21N

29a. $a=0$ since $35.6\text{N}<43.8\text{N}$

b. $-3.88\mathbf{i}$ N

c. $-1.03\mathbf{i}$ N

Ch 6 #14

Don't worry about μ_s on this one, because it will be a large enough force to overcome static friction and accelerate the block. Technically, you're supposed to check whether or not the block would even move. But you'll have plenty of time to practice that idea later (like on #17).

Ch 6 #20

On part A, since F is barely keeping the box from sliding down, static friction must be opposing that potential motion and acting up the plane. On part B, since F is almost overcoming static friction and moving the box up the plane, static friction must be opposing that potential motion and acting up the plane. Part C is just like B, since the box is now moving up the plane, but it's kinetic friction now that opposes the motion.

Ch 6 #21

Start this whole problem by finding the maximum force that static friction can provide, and then each part of the problem will involve a comparison with that maximum. On parts A and B, $(P+F_{gx})$ is smaller than $F_{s,max}$, so the box doesn't move and F_s is just in equilibrium with the other two forces. On part C, $(P+F_{gx})$ is greater than $F_{s,max}$, so the box slides and friction is now kinetic in nature.

Ch 6 #23

This problem is easiest if you just think of the knot as the object of interest. Then the knot only has three forces acting on it, one vertical (equal to the weight of A), one horizontal (equal to the frictional force on B), and one angled (tension in the string). If you start by considering the horizontal situation, you'll realize that the x-component of the tension must be balancing the previously-mentioned horizontal force. You can then use this x-component, along with the given angle, to find the y-component of the tension, which equals the weight of block A!

Ch 6 #25

Just set up the connected-objects 2nd law equation (focusing on the whole system's acceleration), and watch as the M's beautifully cancel out.

Ch 6 #26

Read carefully to make sure you even understand what this one's talking about. In an experiment, an object is inclined at a certain angle on a plane, being pulled so that it almost moves up the plane. The force and coefficient of friction are noted, and then the plane is switched to a new texture (while leaving it at the same angle), which raises the value of the coefficient of friction, which then increases how hard that force has to pull up the incline to almost move the object.

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Ch 6 #26 (cont.)

So, you'll need to set up two different equilibrium equations, one involving F_1 (with no friction) and one involving F_1 (where $\mu_s = 0.5$). With the two equations, they'll both be missing m and θ , so solve one of them for m and substitute that expression into the other equation. You should have to remember that $\sin\theta/\cos\theta = \tan\theta$, but other than that, you should be okay now. (Whew!)

Ch 6 HW Assignment: Answers & HW Hints (Pt. 2)

Part 2: Drag Force and Terminal Speed

Pg. 131-134 #76, 73, 37, 38a, 39a

Answers

76. 6204.9N

73. 147.2m/s

37. 2.27

38a. 66.0m/s

39a. 324km/h

Ch 6 #37

Because it's asking you for a ratio of the drag forces, it's not important that you calculate actual values for drag forces. Instead, find the best expression you can for each drag force, and then divide them (in the ratio), which will cancel any unknown terms.

(Also, don't forget to convert speed to S.I. units.)

Ch 6 #39

This one uses a simple idea that you haven't yet encountered: drag force doesn't necessarily have to be a hindrance, but can instead be the 'forward' force that helps move an object. This is the case, for instance, with wind turbines. It's also the case on this particular problem.

Ch 6 HW Assignment: Answers & HW Hints (Pt. 3)

Part 3: Centripetal Forces

Pg. 134-136 #41, 43, 45-47, 51, 55, 60

Answers

41. 20.69m

43. 0.60

45a. 10.30s

b. 486.3N

c. 1081.7N

46a. 3693.3N

b. Upward

c. -1306.7N

d. Downward, or not at all?

47. 1372N

51. 12.25°

55. 1.81m/s

60a. 0.397N

b. 1.91s

Ch 6 #47

Use the first hill to determine the car's speed, and then use it in regard to the second hill to determine the second F_N .

Ch 6 #51

Start by drawing a free-body diagram, and you'll realize that there's only two forces acting: Tension (angled) and Gravity (down). You can set the y-component of tension equal to the object's weight, since it's in vertical equilibrium. You can also say that the x-component of tension is the only force causing the object to undergo its centripetal acceleration. When you set up expressions for each of those, you can combine them with \tan^{-1} to find the angle.

Ch 6 #60

Start by finding the angle the string makes with the vertical, simply from some geometric ideas: you know the string's length and the radius of the circular path (basically). So draw a triangle and you should be good on the angle. Then for part A you need to use that angle and think about vertical equilibrium. For part B, think about horizontal acceleration (centripetal), which you can use to solve for v , which you can use to solve for the period of motion.